INFLUENCE OF THE BUILT ENVIRONMENT ON PERSONAL EXPOSURE TO FINE PARTICULATE MATTER IN CYCLISTS DURING THE MORNING COMMUTE IN A CANADIAN CITY

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Background and Aims: The health impacts of exposure to fine particulate matter air pollution ($PM_{2.5}$) conflict with the health benefits of commuting by active transport. This is of special concern to commuting cyclists as they are often near air pollution generating traffic and respiring at an elevated rate. Long-term and short-term exposure to $PM_{2.5}$ has been implicated epidemiologically in numerous cardiovascular and respiratory ailments. Personal exposure studies are critical as single-site ambient monitors do not adequately capture environmental variations and consistently report lower pollution measurements.

Methods: Participants were equipped with a GPS and a portable device which measures $PM_{2.5}$ both recording at one second intervals. Five routes totalling approximately 50km were cycled during the morning commute for 5 days across the city bicycle network in a midsized Canadian city (London, ON). GIS was employed to spatially analyze over one hundred thousand pollution data points.

Results: This study found that mean individual exposure of $22.8\mu g/m^3$ was significantly greater than mean hourly ambient measures of $12.88\mu g/m^3$ ($p = 0.03$). Although atmospheric conditions such as wind direction ($r = 0.72$) were found to correlate with daily personal exposure to $PM_{2.5}$, intraurban variation was still present in the data normalized to control for temporal meteorological effects.

Conclusions: This study aims to be the first to incorporate elements of the built environment, such as the presence of street trees, traffic volume, traffic speed, urban morphology (e.g. block length, distance to nearest intersection), and land uses into a regression model in order to account for the variation and hotspots of $PM_{2.5}$.